

DATA SHEET

ANESTHESIA SYSTEM  
FLOW-i

MAQUET  
GETINGE GROUP

CRITICAL CARE





## FLOW-i

<b>GENERAL</b>			
	C20	C30	C40
Base system weight (depending on configuration)	Approx. 155 kg	Approx. 155 kg	Approx. 150 kg
Dimensions of base plate	692 x 985 mm	692 x 985 mm	406 x 897 mm (measured over table-top and grips)
Height (1 drawer)	N/A	835 - 1025 mm (adjustable)	632 mm
Height (2 drawers)	860 mm	N/A	802 mm
Height (3 drawers)	1030 mm	N/A	N/A
Drawers	2-3 (1 lockable)	1 (lockable)	1-2 (1 lockable)
Vertical shafts for optional horizontal rails	4	4	4
Wheels	Four wheels (diameter 150 mm) with separate brakes	Four wheels (diameter 150 mm) with separate brakes	Three wheels (diameter 50 mm)
Working surface/writing table	Approx. 420 x 600 mm		
Additional writing table	397 mm x 250 mm		
Reading lamp	Adjustable LED light integrated into the display arm		

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DISPLAY		
Type	LCD touch screen, complete with 11 membrane switches and one rotary knob	
Size	432 mm x 295 mm	
Placement	Attached to display arm	
Viewing area	15", 1024x768 pixels with a palette of 512 colors	
Waveforms	Up to 6 waveforms, user configurable	
Trends	<ul style="list-style-type: none"> <li>■ Graphic display, 1 to 24 hour resolution</li> <li>■ Numeric display, 1 to 60 minute resolution</li> </ul>	
ENVIRONMENT		
	Operating conditions	Non-operating conditions
Ambient temperature	+15°C to +35°C (+60°F to +95°F) (Desflurane: +15°C to +30°C, +60°F to +85°F)	-25°C to +60°C (-15°F to +140°F)
Battery	+15°C to +35°C (+60°F to +95°F)	+5°C to 40°C (40°F to 104°F)
Relative humidity (non-condensing)	15% to 95%	< 95%
Atmospheric pressure	700 hPa – 1060 hPa	470 hPa - 1060 hPa

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<b>MAXIMUM LOAD</b>			
<b>Accessory/Option</b>	<b>C20, max load (kg)</b>	<b>C30, max load (kg)</b>	<b>C40, max load (kg)</b>
Additional writing table	5	5	5
Drawer	5	5	5
Column mounting position	13.5	13.5	13.5
Auxiliary O <sub>2</sub> & Suction module mounting position	2.5	2.5	2.5
Parameter box support arm	5	5	5
Working surface/writing table	20	5	5
4 vertical shafts	5 kg per shaft	5 kg per shaft	5 kg per shaft
Horizontal rails for hanging accessories	3	3	3
Additional arm	12	12	12
Extra backup gas holder (incl. full gas cylinder)	13	13	N/A
Top shelf	20	20	20
Universal bracket	30	30	N/A

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ESSENTIAL PERFORMANCE		
PEEP (all modes)	$\pm 20\%$ or $\pm 2 \text{ cmH}_2\text{O}$ from set PEEP-level (whichever is greater)	
Respiration rate (all modes)	$\pm 10\%$ or $\pm 2 \text{ bpm}$ (whichever is greater)	
Fresh gas $\text{O}_2$ concentration (all modes)	Air/ $\text{O}_2$	<ul style="list-style-type: none"> <li>■ Range 21-59% <math>\pm 6\%</math>ABS, but always at least 21%</li> <li>■ Range 60-100% <math>\pm 10\%</math>ABS</li> </ul>
	$\text{O}_2/\text{N}_2\text{O}$	<ul style="list-style-type: none"> <li>■ Range 28-59% <math>\pm 6\%</math>ABS</li> <li>■ Range 60-100% <math>\pm 10\%</math>ABS</li> </ul>
Fresh gas agent concentration (all modes, Sevo., Iso., Des.)	$\pm 20\%$ of set value or $\pm 10\%$ of maximum possible setting (whichever is greater)	
Pressure level above PEEP (Pressure Control/Support only)	$\pm 15\%$ or $\pm 3 \text{ cmH}_2\text{O}$ (whichever is greater)	
Tidal volume delivery (Volume Control)	$\pm 15\%$ or $\pm 15 \text{ ml}$ (whichever is greater)	

## **FLOW-i**

<b>STANDARDS - SAFETY AND FUNCTIONALITY</b>	
Safety	IEC 60601-1 (Class 1, Type B), IEC 60601-1-1, IEC 60601-1-2, IEC 60601-1-8, IEC 60601-2-13, IEC 62304, ISO 8835-2, ISO 8835-3, ISO 8835-4, ISO 8835-5, ISO 5360:2009
Electromagnetic compatibility	IEC 60601-1-2
Respiratory gas monitoring	ISO 21647
Usability	IEC 62366
Cleaning	IEC 60601-1, IEC 60601-2-13
<b>Classification according to IEC 60601-1:</b>	
Class I equipment:	according to the type of protection against electrical shock
Type B equipment:	according to the degree of protection against electrical shock
Continuous operation:	according to the mode of operation (not applicable to the lift, 10% duty cycle)
<b>Classification according to EU Medical Directive 93/42/EEC:</b>	
The anesthesia system is classified as IIb.	

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POWER SUPPLY		
<b>Mains power</b>		
Mains power	100-120V, 220-240V, AC 50-60Hz	
Power consumption (C30)	560 VA (auxiliary power outlet not included)	
Power consumption (patient monitor and maximum auxiliary configuration)	1250 VA	
Mains fuse	2x4A (230V)/2x8A (110V)	
Lift fuse	1A (230V)/2A (110V)	
Patient monitor	1A (230V)/2A (110V)	
<b>Battery</b>		
Type	Sealed acid-lead rechargeable	
Capacity	38 Ah	
Operating time	Approx. 90 minutes	
Charging time	Approx. 6 hours	
<b>Auxiliary power outlets (option)</b>		
Power outlet	All auxiliary outlets and the patient monitor outlet are connected to an isolation transformer. Voltage depends on wall power supply	
Type of electrical outlet	Max load from each outlet	Max load total
3 x IEC outlets	2A (230V)/4A (110V)	2A (230V)/4A (110V)
1 x IEC patient monitor power cable	1A (230V)/2A (110V)	1A (230V)/2A (110V)

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GAS SUPPLY INLETS AND GAS OUTLETS		
<b>Central gas</b>		
Supply pressure inlet	Air/O <sub>2</sub> /N <sub>2</sub> O	250-650 kPa/2.5-6.5 bar/ 36-94 PSI
Hospital central gas supply must be able to deliver a flow of at least 60 l/min at a supply pressure of 2.8 bar (280 kPa, 41 PSI)		
Connection standards	<ul style="list-style-type: none"> <li>■ AGA</li> <li>■ DISS</li> <li>■ NIST</li> <li>■ French standard</li> </ul>	
Maximum levels:	Air	<ul style="list-style-type: none"> <li>■ H<sub>2</sub>O &lt; 7 g/m<sup>3</sup></li> <li>■ Oil &lt; 0.5 mg/m<sup>3</sup></li> <li>■ Chlorine must not be detectable</li> <li>■ H<sub>2</sub>O &lt; 20 mg/m<sup>3</sup></li> </ul>
Maximum inlet gas temperature	<35°C (<95°F)	
<b>Gas supply outlets</b>		
O <sub>2</sub> outlet	Dependent on central gas supply pressure or cylinder inlet pressure	
Air outlet	Dependent on central gas supply pressure or cylinder inlet pressure	

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<b>Backup gas supply (option)</b>	
Pin Index cylinders (5l)	Electronically measured cylinder pressure, Quick-release system for docking and release
Weight and size (backup gas system)	Approx. 35 kg excluding gas cylinders, 350 mm x 830 mm x 287 mm
Cylinder configuration (backup gas system)	Max 2 cylinders: O <sub>2</sub> /N <sub>2</sub> O or O <sub>2</sub> /Air
Weight (backup gas holder)	Approx. 13 kg excluding gas cylinder
Cylinder configuration (backup gas holder)	N <sub>2</sub> O
Cylinder pressure, O <sub>2</sub> /Air	Max. 20,000 kPa / 200 bar / 2900 PSI
Cylinder pressure, N <sub>2</sub> O	Max. 8,000 kPa / 80 bar / 1160 PSI
Cylinder safety valve opening pressure	Air/O <sub>2</sub> and N <sub>2</sub> O
	650 kPa/6.5 bar/94 PSI
All gases and anesthetic agents must conform to the European and American Pharmacopeia.	

## FLOW-i

ANESTHESIA GAS SCAVENGING (AGS)		
Type	Passive system (including a flow indicator) integrated into the system	
Scavenging flow	Minimum 25 l/min, or 10 l/min over the set minute volume, whichever is greater.	
Outlet connections	<ul style="list-style-type: none"> <li>■ 30 mm ISO taper</li> <li>■ DISS EVAC</li> <li>■ 12.7 mm / ½" in hose Barb</li> <li>■ 25 mm / 1" Barb</li> <li>■ AGA EVAC</li> </ul>	
FRESH GAS FLOW		
Gas mix	Air/O <sub>2</sub> O <sub>2</sub> /N <sub>2</sub> O	Electronic Servo controlled Electronic Servo controlled
Fresh gas flow range	<ul style="list-style-type: none"> <li>■ MAN = 0.3 - 20 l/min</li> <li>■ AUTO = 0.3 - 20 l/min (FGF delivery depending on set MV)</li> <li>■ AFGO = 1.0 - 20 l/min</li> </ul>	
Fresh gas O <sub>2</sub> /air Flow (numerical/bargraph)	Selectable	
Fresh gas O <sub>2</sub> /N <sub>2</sub> O Flow (numerical/bargraph)	Selectable	
Preset O <sub>2</sub> concentration	Air/O <sub>2</sub> O <sub>2</sub> /N <sub>2</sub> O	21% - 100% 28% - 100%
O <sub>2</sub> Flush	<ul style="list-style-type: none"> <li>■ Approx. 50 l/min</li> <li>■ 2 cmH<sub>2</sub>O expiratory resistance when APL is set to SP</li> </ul>	

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<b>BREATHING SYSTEM</b>		
Type	Circle system with Volume Reflector	
System volume (incl. absorber, without patient tubings and manual breathing bag)	Approx. 2.9 l	
Maximum volume allowed for patient tubings and optional equipment forming part of the circle system	3000 ml	
Drive gas	O <sub>2</sub>	
CO <sub>2</sub> absorber	<ul style="list-style-type: none"> <li>■ Volume</li> <li>■ Absorber material</li> </ul>	<ul style="list-style-type: none"> <li>0.7 l</li> <li>Sofnolime™</li> </ul>
Patient tube connections	22/15 mm ISO cone	
Type of material (breathing circuit system)	PPSU (Polyphenylsulphone).	
System compliance (volume of gas lost due to internal compliance - manual mode only)	Approx. 3 ml/cmH <sub>2</sub> O	
Internal resistance	6 cmH <sub>2</sub> O at a flow of 1 l/s	
<b>Manual ventilation</b>		
Electronic APL valve	Spontaneous breathing (SP) and adjustable pressure up to 80 cm H <sub>2</sub> O	
<b>AFGO - Additional Fresh Gas Outlet (option)</b>		
Type	<ul style="list-style-type: none"> <li>■ 22 mm coaxial/15 mm conical outlet connections</li> <li>■ Pneumatic powered SW controlled (from user panel)</li> </ul>	
<b>Emergency backup ventilation</b>		
Emergency APL valve	SP - 80 cmH <sub>2</sub> O	
O <sub>2</sub> emergency flow	0 - 10 l/min	

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VENTILATOR	
Type	Pneumatic powered Servo controlled
Patient range	Neonatal to Adult
Ventilation modes	<ul style="list-style-type: none"> <li>■ Manual/Bag</li> <li>■ AFGO (option)</li> <li>■ Volume Control (VC)</li> <li>■ Pressure Control (PC)</li> <li>■ Pressure Support (PS, option)</li> <li>■ Pressure Regulated Volume Control (PRVC, option)</li> <li>■ Synchronized Intermittent Mandatory Ventilation (SIMV, option)</li> </ul>
Tidal volume (VT)	20 - 2000 ml $\pm 10\%$ of actual value or 10 ml, whichever is greater
Minute Volume (MV)	0.3 - 60 l/min
Compressible volume compensation	Yes
Inspiratory flow	Maximum 3.3 l/s (200 l/min)
Breathing frequency	4 – 100 $\pm 1$ breaths/minute
I:E (VC, PC)	1:10 - 4:1
PEEP	0 – 50 cmH <sub>2</sub> O
Trigger	Flow / Pressure
Inspiratory pressure (PC)	0 - 120 cmH <sub>2</sub> O
Inspiratory pause (VC)	0 to 30% or 0 - 1.5 s

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Respiratory monitoring	
Administered breaths	1-100 $\pm 1$ breath/minute
Loops	<ul style="list-style-type: none"> <li>■ Flow – Volume</li> <li>■ Volume – Pressure</li> </ul> <p>Additional display options include having a reference loop and/or the last two loops shown together with the real-time loop</p>
Inspiratory Minute Volume	0.3 - 60 l/min $\pm 15\%$ or $\pm 15$ ml multiplied by the breathing frequency, whichever is greater
Expiratory Minute Volume	0.3 - 60 l/min $\pm 15\%$ or $\pm 10$ ml multiplied by the breathing frequency, whichever is greater
Inspiratory Tidal Volume	20 - 2000 ml $\pm 15\%$ of actual value or 15 ml, whichever is greater
Expiratory Tidal Volume	20 - 2000 ml $\pm 15\%$ of actual value or 10 ml, whichever is greater
Mean Airway Pressure	0 – 100 cmH <sub>2</sub> O
Peak Airway Pressure	0 - 140 cm H <sub>2</sub> O
End Expiratory Airway Pressure	-40 – 100 cmH <sub>2</sub> O
Airway Pressure	-30 to 140 cm H <sub>2</sub> O
Airway pressure accuracy (applicable to all pressure measurements)	$\pm 5\%$ of actual value or $\pm 2$ cmH <sub>2</sub> O, whichever is greater

## FLOW-i

Alarms	
Airway pressure: High	16 - 120 cmH <sub>2</sub> O
Expiratory Minute Volume: High	0.5 - 60 l/min
Expiratory Minute Volume: Low	0.01 - 40 l/min
Excessive leakage	The difference between the maximum and minimum pressures during inspiration is too low
Continous APL pressure (manual mode only)	Activated when the measured airway pressure exceeds the set APL by >7-10 cmH <sub>2</sub> O (dependant on APL setting) for >15 s ±1.5 s
High continuous pressure (automatic mode only)	Set PEEP level +15 cmH <sub>2</sub> O for more than 15 seconds
Regulated Pressure Limited (PRVC mode only)	Permissible pressure limits pre-set tidal volume
PEEP: High	0 - 55 cmH <sub>2</sub> O
PEEP: Low	0 - 47 cmH <sub>2</sub> O
Respiratory Rate: High	1 - 140 B/min and OFF
Respiratory Rate: Low	1 - 140 B/min and OFF
Apnea (manual mode only)	5 - 45 s. and OFF
Long apnea (manual mode only)	No breath detection for up to 120 s
Backup ventilation	Pressure controlled administered breath detected in pressure support backup mode due to time out of the backup respiratory rate parameter.
Check breathing circuit	Activated when Insp. and Exp. pressures fail to meet preset requirements
Limited battery capacity	Less than 18 minutes left of battery operation.
No battery capacity	Less than 3 minutes left of battery operation.
Water trap missing/Replace water trap	The gas analyzer has detected that a water trap replacement is needed

## FLOW-i

VAPORIZER		
Agents	Isoflurane, Sevoflurane and Desflurane	
Type	Electronic Injector	
Weight (full)	Approx. 3.2 kg	
Dimensions (mm)	70 x 215 x 178	
Capacity	300 ml	
Residual capacity	30 ml (triggering the low level alarm)	
Setting range	Isoflurane Sevoflurane Desflurane	0 - 5% 0 - 8% 0 - 18%
Accuracy	±15% of set value or ±5% of maximum possible user setting (whichever is greater)	
Filling system	Isoflurane Sevoflurane Desflurane	Maquet filling adapter Quik Fil® and Maquet filling adapter Saf-T-Fil®
Vaporizer filling speed	Approx. 4 ml/s	
Overfill protection	Overfilling prevention systems built into the vaporizer	
Tank liquid lever	Optical and electronic	
Agent usage tracking	<ul style="list-style-type: none"> <li>■ Individual agent usage for each of the last 20 patient cases</li> <li>■ Total agent usage since last user reset</li> </ul>	

**FLOW-i**

<b>PATIENT SUCTION AND AUXILIARY O<sub>2</sub> MODULE (OPTION)</b>	
Weight	Approx. 2.2 kg
Patient suction supply pressure (Air)	300-650 kPa/3-6.5 bar/44-94 PSI
Auxiliary O <sub>2</sub> supply pressure	300-650 kPa/3-6.5 bar/44-94 PSI
Auxiliary O <sub>2</sub> flow range	0 - 10 l/min
Max. vacuum (suction)	-90 kPa when gas supply is 6.5 bar
Max. suction flow	90 l/min when gas supply is between 5.0 and 6.5 bar

## FLOW-i

PATIENT GAS ANALYZER		
Measuring technology	O <sub>2</sub> Agents, CO <sub>2</sub> , N <sub>2</sub> O	Paramagnetic sensor IR sensor
Warm-up time	ISO standard accuracy Full accuracy	Within 60 s Within 10 minutes
Sampling flow	200 ml/min (Return to circuit)	
Measured parameters		
Resp. rate	2 - 100 breaths/min	
Respiration rate measurement accuracy	<60 breaths/minute >60 breaths/minute	± 1 breath/minute Unspecified
Gas measuring range	O <sub>2</sub> N <sub>2</sub> O CO <sub>2</sub> Isoflurane Sevoflurane Desflurane	0 - 100% 0 - 80% 0 - 10% 0 - 5% 0 - 8% 0 - 18%
Inspiratory and End-Tidal O <sub>2</sub> Concentration	Yes	
Inspiratory and End-Tidal CO <sub>2</sub> Concentration	Yes	
Inspiratory and End-Tidal N <sub>2</sub> O Concentration	Yes	
Inspiratory and End-Tidal Agent Concentration	Yes	
Automatic AA identification	Yes. Agent mixtures are displayed containing a Primary and Secondary agent (classification depending on relative agent concentration)	

## FLOW-i

Gas alarms	Lower limit setting range	Upper limit setting range
Inspiratory O <sub>2</sub> concentration alarm	18 - 99%	23 - 99% and OFF
Expiratory O <sub>2</sub> concentration alarm	10 - 99% and OFF	13 - 99% and OFF
Inspiratory CO <sub>2</sub> concentration alarm	---	0.1 - 15% and OFF
Expiratory CO <sub>2</sub> concentration alarm	0.1 - 1.49% and OFF	0.1 - 15% and OFF
Inspiratory AA concentration alarm	0.1 - 5.0% and OFF (ISO) 0.1 - 8.0% and OFF (SEV) 0.1 - 18% and OFF (DES)	0.1 - 5.0% (ISO) 0.1 - 8.0% (SEV) 0.1 - 18% (DES)
Expiratory AA concentration alarm	0.1 - 4.0% and OFF (ISO) 0.1 - 6.0% and OFF (SEV) 0.1 - 12% and OFF (DES)	0.1 - 5.0% and OFF (ISO) 0.1 - 8.0% and OFF (SEV) 0.1 - 18% and OFF (DES)
Agent mixture: MAC > 3	The MAC of the secondary agent is $\geq 0.6$ and the total MAC value is $\geq 3$	
Agent mixture	The second agent is MAC $\geq 0.6$ and the total MAC value is <3	
Insp N <sub>2</sub> O: High	Insp. N <sub>2</sub> O gas supply >80%	

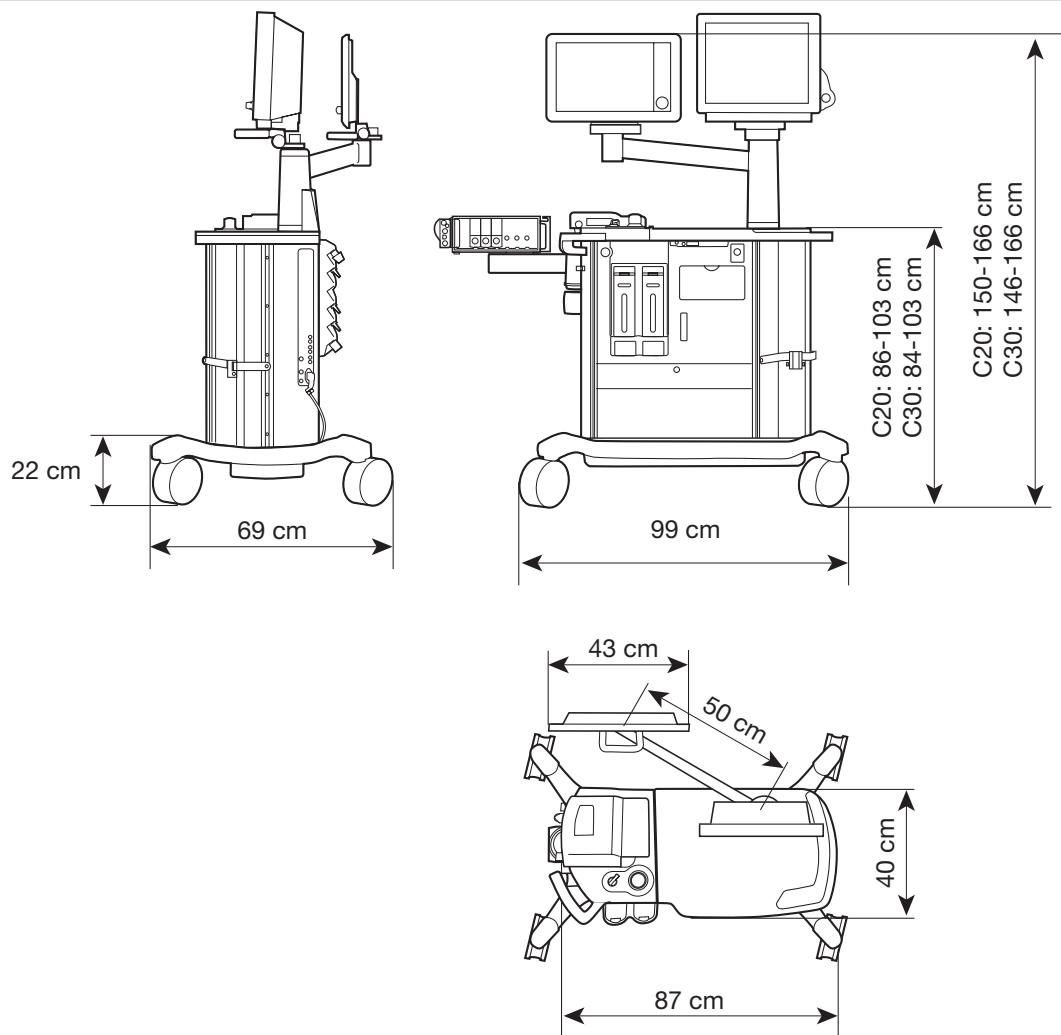
## FLOW-i

EXTERNAL COMMUNICATION		
Serial ports	2 x RS232	FCI protocol
USB	1	
Video out	1 VGA	
Ethernet	1	Network connection for service use

The product may be pending regulatory approvals to be marketed in your country. Contact your MAQUET representative for more information.

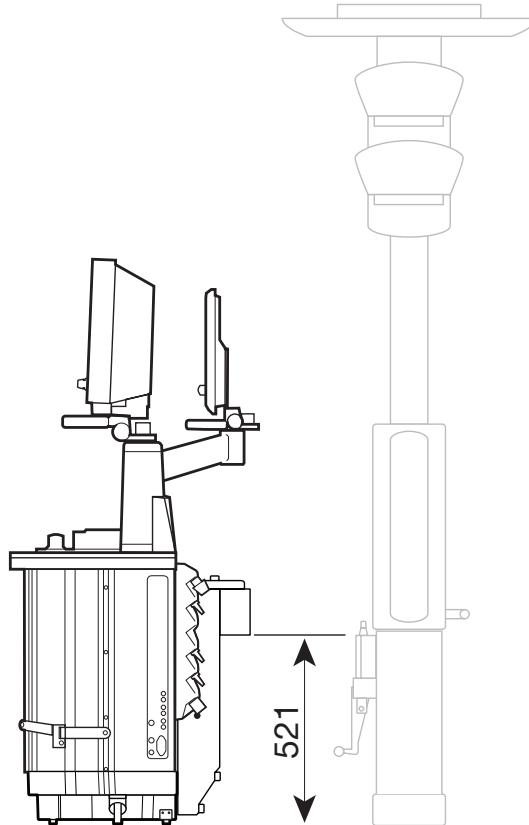
## FLOW-i

Dimensional drawings (showing C20 model only)



## FLOW-i

Dimensional drawing showing the C40 model. Several ceiling pendant solutions are available. The minimum height requirement of the pendant interface is 521 mm relative to the floor level when using the MAQUET ceiling pendant.





# MAQUET

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